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IMPORTANT CAUSES OF SICKNESS AND DEATH[1] [2]

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What are the most important diseases that result in sickness and death at the present time? On casual thought, this question seems easily answered. Sickness is reported to health departments; deaths are registered and analyzed currently; perusal of a few volumes should give the answers. All students of the subject know, however, that there is no simple answer; or, rather, that there are too many answers. Perhaps there needs to be a clearer understanding that there are many approaches and that the relative importance to be attached to a disease will depend on the point of view. The aim of this review is to indicate what some of these approaches are and the various pictures that they yield. For instance, it will be found that one picture is given by records of mortality, another by those of acute illness, another by those of chronic disease, another by medical examinations. These different approaches have been represented in a series of nineteen charts, covering many different phases, some much more significant than others, but all worth a certain amount of consideration in evaluating the importance of any one disease as a cause of ill health or death.

In order to make the material as useful as possible, a composite ranking of diseases and conditions has been attempted. Methods of arriving at this summary will be explained later. It is presented simply as a first approximation, to help in clarifying somewhat the confusion of dealing with so many different points of view.

A few considerations are of special significance in evaluating this material. First, many conditions of grave importance may not be of such a character as to be revealed by standard methods of approach. Their importance, however, might well be shown by special surveys. Thus, information derived from these charts must be supplemented

[1] The data utilized in this paper were prepared in connection with the work of a committee appointed by Asst. Surg. Gen. L. R. Thompson to assist in the formulation of criteria for research projects in public health, the members of the committee being Medical Director J. P. Leake, Principal Statistician G. St. J. Perrott, and the writer.

[2] Acknowledgment is made to Junior Statistician Jennie C. Goddard for help in assembling the data.

in the mind of the reader by special knowledge or by realization of the potential hazard in specific public health problems. Second, the fact that one cause will be at or near the top in one of these graphs and much further down in another, or absent entirely, does not imply any inconsistencies in the material, but rather that, as stated, different methods of approach emphasize different conditions. Third, no attempt is made to include any but the major causes from these points of view, otherwise, no summary in brief space would be possible. Fourth, it has not seemed useful for the present purpose to summarize omitted conditions by broad groups of causes, because of the arbitrariness of such groups. Fifth, although the attempt is made to deal with specific causes, it is not possible to do this literally except

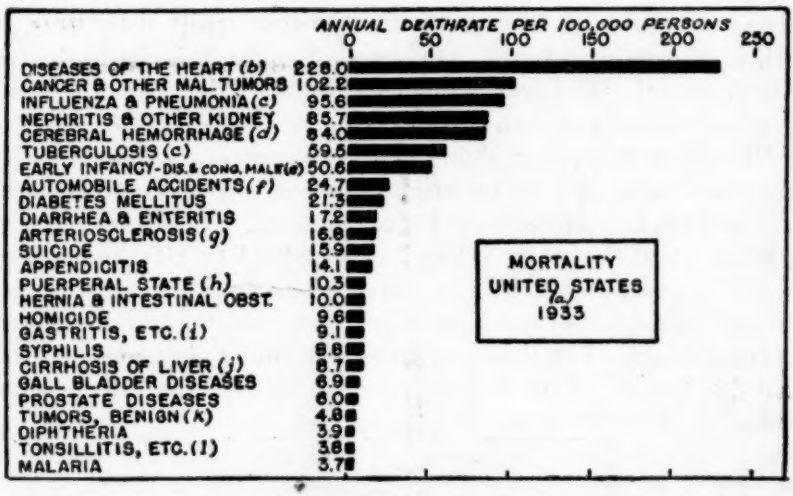

FIGURE 1.

(Explanatory references to the graphs, figs. 1-19, will be found in the Appendix, pp. 966-969.)

in a few instances. Most of the causes given represent groups of diseases. Sixth, many detailed qualifications would be necessary for a thorough evaluation of the data given. Since our purpose is merely to provide a list of conditions which seem important by reason of their great prevalence or incidence, the reader must be referred to the publications covering the different sets of material for such detailed discussions, although the following paragraphs will broadly distinguish one source of data from another. No attempt will be made to discuss the implications of the material.

MORTALITY

Figure 1 gives the rate of mortality for the whole United States in 1933 by cause. (In the consideration of the detailed entries in each chart, attention is specifically called to the explanatory references in the appendix.) The rates listed cover 81 percent of the deaths for

the given year. No particular explanation of data of this character seems necessary, except to say that primary causes only are mentioned (where joint causes of death appear on a death certificate, the Census Bureau follows specific rules for selecting the primary cause). Some of these causes (notably influenza and pneumonia, diarrhea and enteritis, and diseases of the heart) would be markedly increased if contributory causes were added.[3]

Since diseases of the heart appear most important as a cause of death by a wide margin, it will be of interest to note the relative importance of various forms of heart disease as classified from the death certificates: Chronic myocarditis, 75.4 per 100,000 persons; chronic endocarditis, valvular diseases, 46.9; functional diseases,

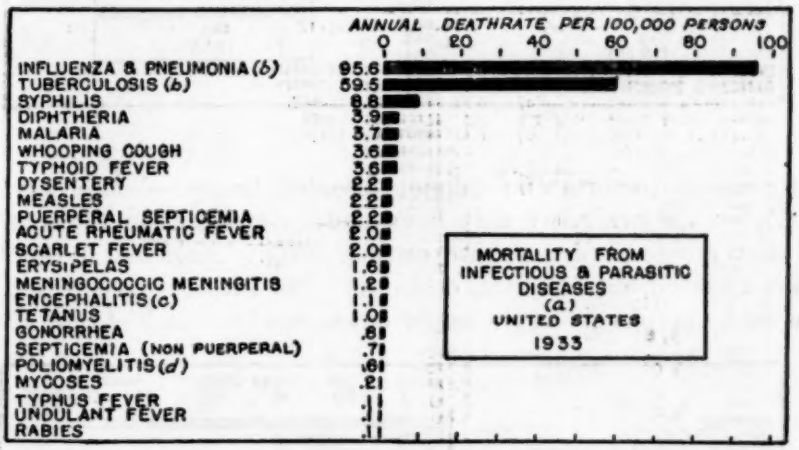

FIGURE 2.

35.3; diseases of coronary arteries, 21.9; angina pectoris, 15.9; and other, 32.6. No information as to etiology is possible from such data.

Certain of these diseases offer methods of control applicable to groups of the population as a whole and are, therefore, from a public health point of view, of more importance than others. Accordingly, figure 2 presents the rates of mortality for a group of diseases (infectious and parasitic) which are fundamentally of this character. No special comment is necessary, except to the effect that many diseases not included in the list have a relation to those which are included, because of the part that infection plays in their development (notably those in the heart-disease group).

[3] The last year for which such data are available is 1925. Inclusion of deaths for which the cause was classified as contributory would increase the various causes of death by the following percentages: Influenza and pneumonia, 46 percent; diarrhea and enteritis (2 years and over), 37 percent; diseases of the heart, 31 percent; chronic nephritis, 20 percent; cerebral hemorrhage, 19 percent; cancer, 13 percent; automobile accidents, 9 percent; diabetes, 8 percent; tuberculosis, 0.3 percent; suicide, 0.3 percent (disregarding cases where another disease within a specified group is given as contributory). Were correction made on this basis, the order would not be materially changed, but the importance of the first five causes in the list would be further emphasized.

MORBIDITY

Which diseases will appear at the top of any list based on records of illness depends almost wholly on the method of approach. On the one hand, there are the technical methods by which we secure the

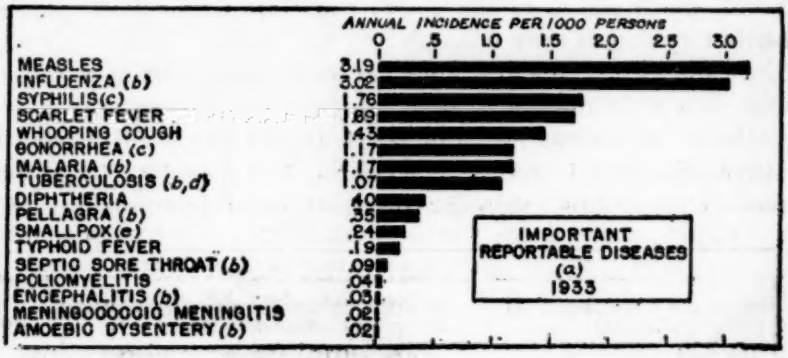

FIGURE 3.

information (reports of notifiable diseases, house-to-house surveys, etc.); on the other, we may have under consideration the number of cases due to a specific cause, or their severity measured in terms of days disabled, days in bed, cost, etc. The present purpose will be served by graphs giving the important causes from each of the various

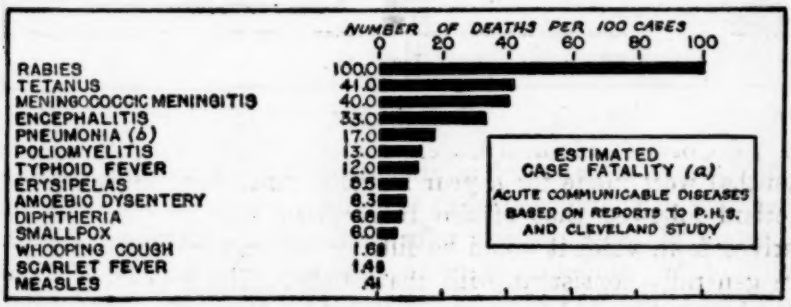

FIGURE 4.

points of view, with a minimal discussion of the different interpretations to be placed on them.

In figure 3 the rate of reported incidence of one type of disease is shown. This is based on reports by the States to the Public Health Service, and covers those diseases which are by law notifiable in the various States. They are all communicable diseases (with one exception). They are mostly of an epidemic character. To a large extent they are diseases of children. Chronic disease is practically not represented in the list. In view of the sources of such reported data,

many mild cases will be missed, and this effect is of course not equal with respect to the different causes.

In judging the importance of a disease, it is necessary to consider the fatality as well as the incidence. In figure 4, accordingly, a composite picture is furnished in regard to case fatality. Because of the limitations of the material on which it is based, it is subject to many difficulties, but does add an interesting approach to the subject.

Shortcomings with respect to reports of notifiable diseases have led to the development of survey methods of ascertaining more accurately the prevalence or incidence of sickness in the population. Without attempting to survey this field from the time of the Metropolitan Life Insurance Co. canvasses, or the Public Health Service Hagerstown study, down to the present time, it seems adequate to

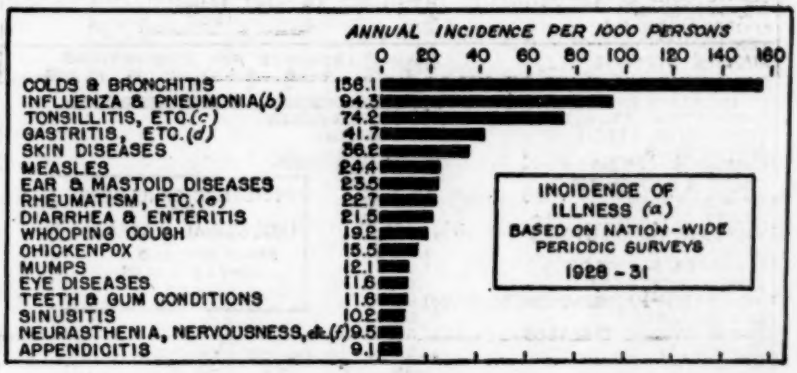

FIGURE 5.

deal with one investigation of this type, that made by the Committee on the Costs of Medical Care. Periodic canvasses (about every 3 months) were made for a year in 9,000 families in 18 States. The method followed that of the Hagerstown study [4] (the inspiration derived from which it would be difficult to exaggerate) and the results are generally consistent with that study. The procedure must be kept in mind in evaluating the data (which are shown in fig. 5). For details of this procedure reference must be made to the sources (and also to the reports of the Hagerstown study). The data give the annual incidence of sickness per 1,000 persons.

Visited at intervals of 3 months, the housewife forgets the minor conditions. Whereas, in this graph, minor respiratory diseases total to a rate of about 300 per 1,000 persons per year, studies designed to obtain information about all minor cases reveal rates 10 times as

[4] Hagerstown morbidity studies. A study of illness in a typical population group. By Edgar Sydenstricker. Reprints nos. 1113, 1116, 1134, 1163, 1167, 1172, 1225, 1227, 1229, 1294, 1303, and 1312 from the Public Health Reports, 1926-29.

high,[5] and similar tendencies might be expected in the case of some other causes (for instance, indigestion) if the data were available.

This type of data relates to incidence of sickness, not prevalence of chronic diseases (which will be discussed later).

Another source of records of sickness is that of reports of sick-benefit associations in industry (fig. 6). Since such reports usually cover disabling illness lasting 8 days or longer, the severity of the conditions reported will be much greater than in the case of data obtained by periodic visits to the home and the incidence very much less.

Admissions to hospitals form another method of evaluating the importance of particular diseases in the general population. Data of this character are available from many sources, and it seemed sufficient for the present purpose to confine our attention to one type—that relating to the marine hospitals of the United States Public

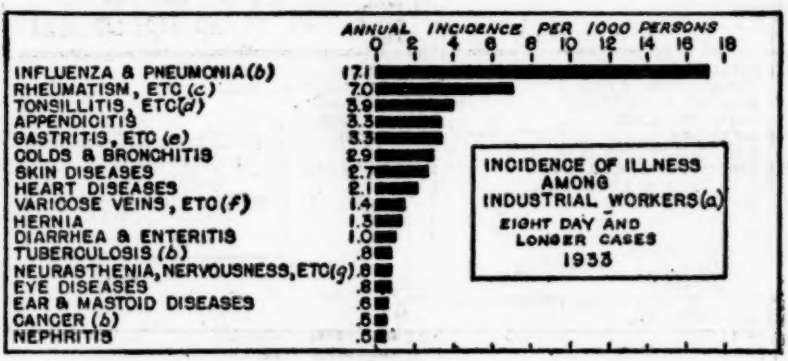

FIGURE 6.

Health Service (see fig. 7). The persons treated are beneficiaries of the Public Health Service, principally merchant seamen. It should be borne in mind that treatment is given to these persons without charge.

Some estimate of the severity of illness in the general population is available by considering the number of days lost (sick, disabled, in bed, etc.). For the present purpose the measure of severity has been taken as the number of days in bed, and in figure 8 the data obtained by the committee on the costs of medical care have been given from this point of view. The different approach is obvious, and needs no special comment, except to observe that we are still dealing with disease as manifested in observable illness.

[5] The following may be quoted from a report of such a study by the Public Health Service: "The student rate of 3,333 respiratory cases per 1,000 approximates closely rates found for 3 consecutive years (3,340, 3,200, and 2,980 per 1,000) by Doull, Herman, and Gafafer for Johns Hopkins medical students. The respiratory rate for 2 consecutive years (3,175 and 3,072 per 1,000) found by Van Volkenburgh and Frost for a group of Baltimore families kept under close observation approximates the student rate in this study (3,333 per 1,000) much more closely than the family rate (1,851 per 1,000)." Selwyn D. Collins and Mary Gover: Incidence and clinical symptoms of minor respiratory attacks with special reference to variation with age, sex, and season. Reprint no. 1594 from the Public Health Reports, Sept. 22, 1933.

CHRONIC DISEASE

The prevalence of disease (i. e., the proportion of the population affected at any particular time) is to be distinguished sharply from the incidence of illness (i. e., the number of cases occurring during a

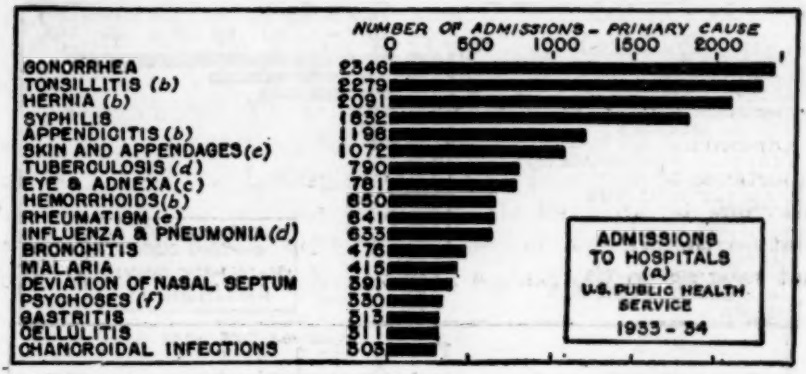

FIGURE 7.

specified period). Chronic conditions, lasting over a period of years, may be very important with respect to the ill-health of a population, but not show up in any great number in a study of cases of illness, because overshadowed by acute, frequently occurring conditions. A

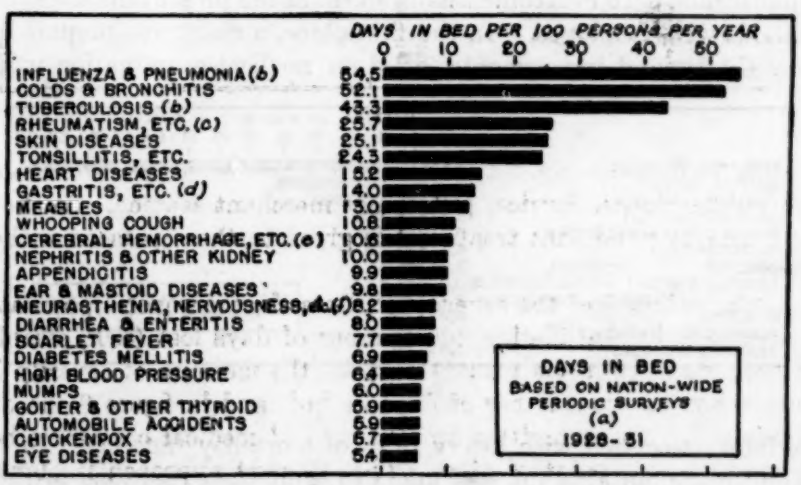

FIGURE 8.

special survey in Massachusetts made to determine the proportion of persons suffering from chronic disease, has been utilized in figure 9 to give an approximation of the importance of different chronic diseases in the general population.

The source just quoted with respect to chronic disease deals with the general population, but includes an estimate of hospitalized and institutionalized cases of cancer, pulmonary tuberculosis and mental

disease since hospitalized cases of these diseases are obviously understated to enumerators. It has seemed well to include also some special data on institutionalized cases. This is done in figure 10 for New York State. As the references show, the material is combined

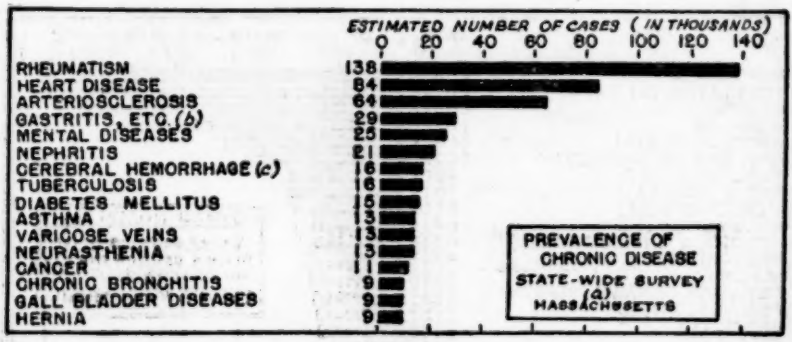

FIGURE 9.

from several sources. The overwhelming importance of mental disease is evident.

A further source of information is available from records of medical examinations of the general population. Such records offer an almost insuperable difficulty in differentiating between serious and minor impairments. To overcome this problem in the present instance, two methods were employed. In the first place, a chart was prepared to show the type of impairments found on medical examination which

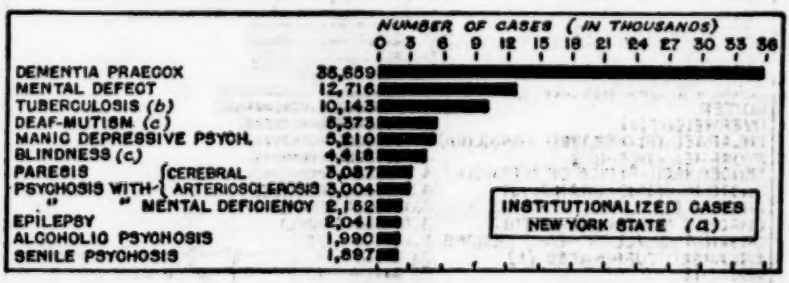

FIGURE 10.

are later associated with heavy rates of mortality (fig. 11). In the second place, an attempt was made to limit the conditions to those of a relatively severe degree by a mathematical calculation. (See references to charts.) The data utilized to show the relative prevalence of impairments noted on medical examinations are based on the adult population (fig. 12) and on the pre-school child (fig. 13).

AGE

Some of the previous material, especially that bearing on mortality and chronic disease, is weighted heavily by the older part of the popu-

lation. In figure 14 the mortality rates by cause have been given for the age group 20–24 years, a period of life when the economic value of a person might be thought to be greatest (the substitution of other age groups for a similar period of life would not affect the relative

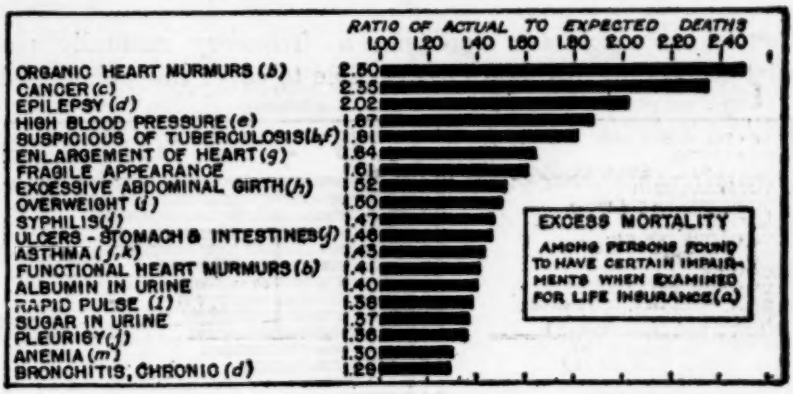

FIGURE 11.

position of different causes of death). It is extremely significant that, for a population of young adults, tuberculosis remains the most important cause of death.

A similar adjustment could be made for the previously given rates of illness based on the survey by the Committee on the Costs of Medical

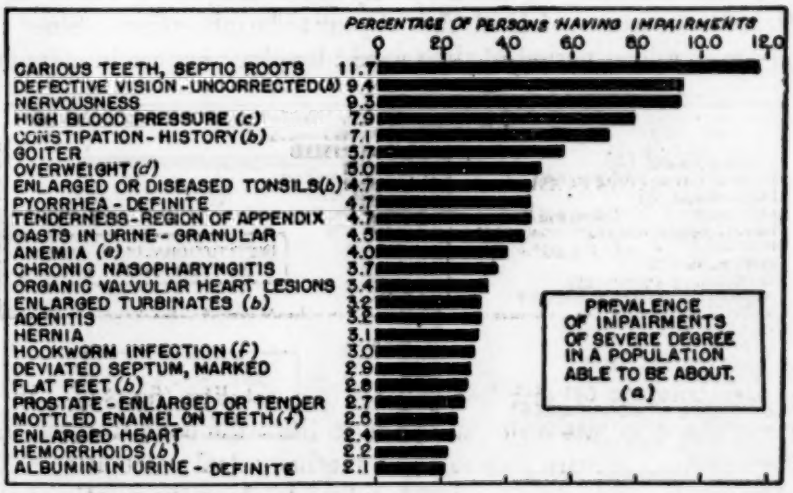

FIGURE 12.

Care, but in the case of sickness the only striking changes brought about by the adjustment would be the dropping out of the diseases of childhood. It may be said that the following conditions tend to show their highest peak in young adult life: Puerperal and female genital, automobile accidents, sinusitis, headache, backache, hemor-

rhoids, appendicitis, respiratory tuberculosis, furuncle, pleurisy, malaria, eye accidents, tumors of ovaries and uterus, quinsy, Vincent's angina, epilepsy, calculi of urinary passages.

TREND

Conditions which are increasing in frequency naturally merit special attention. No data are available to cover this point outside

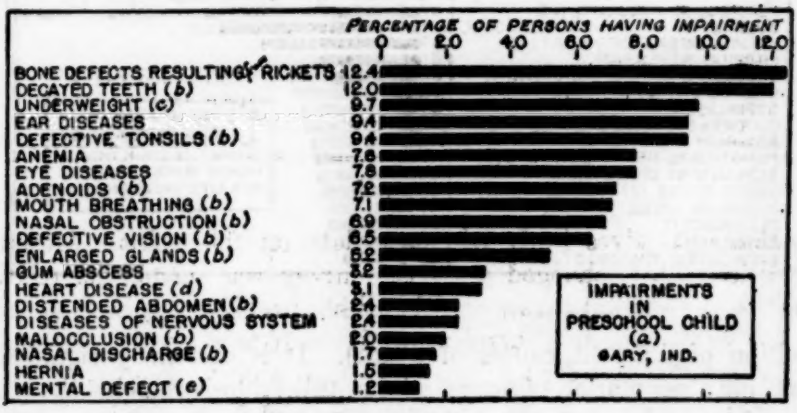

FIGURE 13.

of mortality, which is not a very satisfactory index because of changes in the rate of fatality of diseases. However, it seems worth while to indicate those causes of death that appear to be increasing. Since any study over a long period of time would involve changes in classifica-

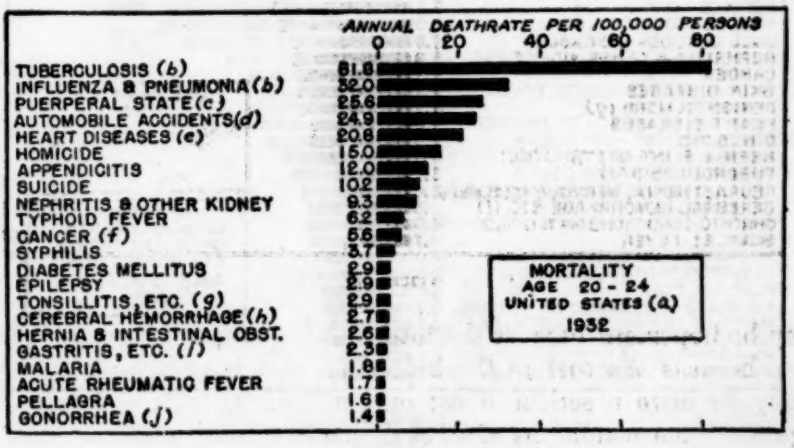

FIGURE 14.

tion or different attitudes on the part of physicians, the comparison has been limited to two periods, 1920–26 and 1927–33. Figure 15 gives the annual percentage increase for specific causes of death

showing a rise during this period. No correction has been made for age, but that is not an important factor over a 7-year period.

RELATIVE COST OF DISEASES

The primary reason why sickness results in insecurity of the population is economic. The survey by the Committee on the Costs of

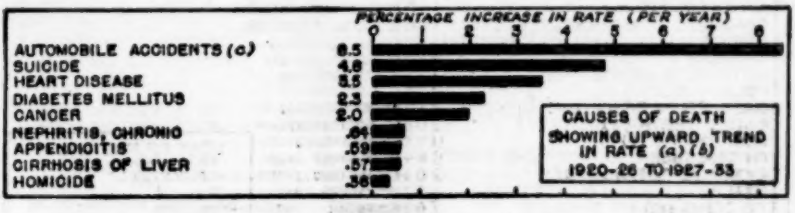

FIGURE 15.

Medical Care gives fairly adequate data on this point. Although conditions have changed since the survey was made, the relative position of different causes of sickness has probably not been affected to any great extent. Therefore, in figure 16 is given the percentage of the total charges for medical care which went for specific causes of sickness. (Care of teeth, confinements, and some other conditions were omitted as not being directly the result of disease.) A disease

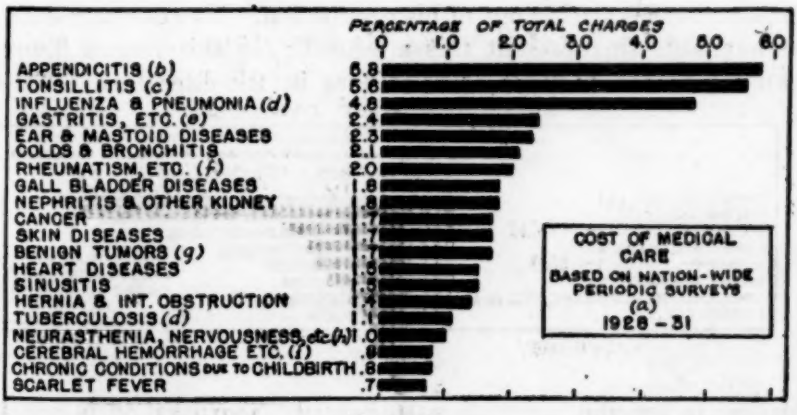

FIGURE 16.

may be important because the total cost is great, or it may be important because the cost of the individual case is great and therefore likely to have a serious effect on the security of the family. In figure 17 the conditions are listed in accordance with the average cost per case.

Associated with this question of cost is the prevalence of disease in those groups of the population least able to meet the cost. The general excess of sickness and mortality in the low economic groups is recognized. In figure 18 are listed the major causes of mortality

showing an excess in the underprivileged (unskilled workers has been used as the index). It may be stated that "all other" is high in this list, showing that many individual causes of death would rank with

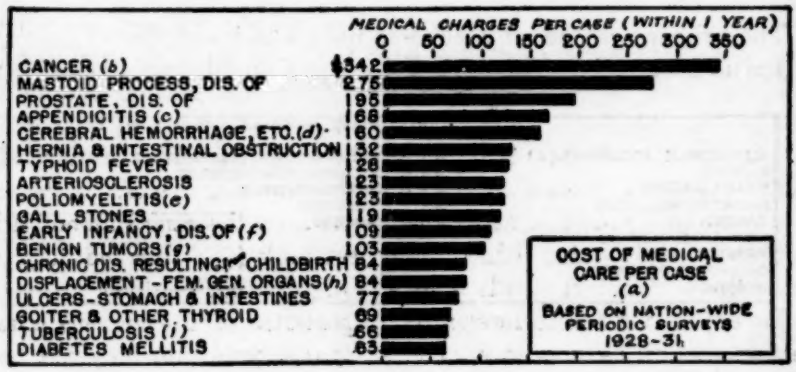

FIGURE 17.

the major conditions given in the table if data on them were available separately.

OTHER POINTS

The approaches considered have failed to throw light on one important aspect of public health—the protection of the worker against diseases arising out of his occupation. No adequate data are yet available to represent this approach; for this reason figure 19 simply lists the number of references in the literature (1931–34)

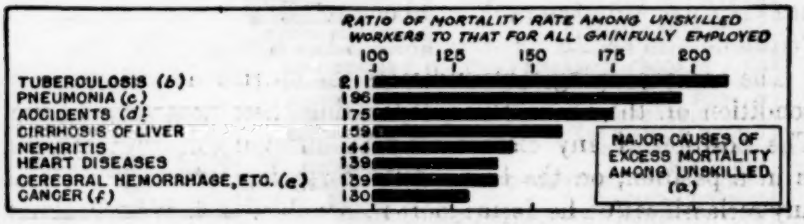

FIGURE 18.

relating to specific occupational diseases. The method is not very satisfactory, but does bring out the importance of certain conditions which would not otherwise be touched upon in this review.

A statement made earlier in the paper must be repeated at this point. Many conditions of grave importance are not of such a character as to be revealed by standard methods of approach. Their importance, however, might be shown by special surveys. The reader must supplement the ground covered in this review by his knowledge of the results of such special surveys and by an understanding of the potential hazards involved in specific public-health problems.

A COMPOSITE PICTURE

To bring together the various approaches into a more or less unified whole, two procedures have been followed: (*a*) The conditions have been assigned a rank in each graph (one for the highest, two for the next, etc.), the ranks being indicated in the index table at the end of the article; (*b*) a composite ranking of diseases and conditions has been attempted in order to establish the relative magnitude of particular conditions, considering all of the different points of view. The most important diseases are placed in the first magnitude. In general, it may be said that the magnitude is based on the rank of a condition in that chart in which it has its highest rank (and thus we may presume that its importance is most adequately represented).

To adjust for the difference in importance of the various charts, certain factors have been added,[6] so that a condition may not be in the first magnitude, even if at the top of a particular chart. For

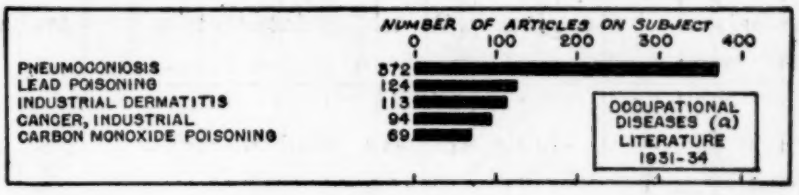

FIGURE 19.

instance, "colds and bronchitis" appears as the most important cause of illness in the general population group. However, the factor 3 has been added to the rank numbers for all items in that chart; thus "colds and bronchitis" is estimated as having a magnitude of 4.

The accompanying table indicates the magnitude assigned to each condition on the above basis, separating them according to groups. The position of any disease may be questionable; but the reader is in a position, on the basis of the foregoing information, to make any reclassification he deems more reasonable. A first approximation, drawing together all of the possible approaches, has seemed desirable in spite of its obvious limitations.

In summary, the outstanding diseases appear to be: (1) Influenza and pneumonia, tuberculosis, heart disease; (2) cancer, rheumatism, dementia praecox; (3) syphilis, appendicitis, mental defect, results of childbirth; and so on down the list.

[6] The factors are:

0: Figs. 1, 2, 14.
1: Figs. 9, 10.
2: Fig. 16.
3: Figs. 3, 8.
4: Fig. 7.
5: Figs. 4, 5, 6.
6: Figs. 15, 17.
7: Figs. 18, 19.
8: Fig. 11.
9: Figs. 12, 13.

Relative magnitude of conditions

Magnitude	A Respiratory	B Other contact	C Other infectious	D Degenerative	E Digestive, etc.	F Nervous and special senses	G Miscellaneous
1	Influenza and pneumonia. Tuberculosis.			Heart diseases.			
2				Cancer. Rheumatism.		Dementia praecox.	
3		Syphilis.			Appendicitis.	Mental defect.	Results of childbirth.
4	Tonsillitis.	Diphtheria. Measles.		Arteriosclerosis. Nephritis.			Automobile accidents.
5	Colds and bronchitis.	Gonorrhea.	Malaria.		Gastritis.	Cerebral hemorrhage. Deaf-mutism.	
6		Whooping cough.	Rabies.			Manic-depressive psychosis.	Homicide.
7		Scarlet fever.	Tetanus. Typhoid fever.		Hernia.	Blindness. Ear and mastoid.	Diseases of early infancy.
8	Pneumoconiosis.	Meningococcus meningitis.	Dysentery.			Paresis.	Skin diseases. Suicide.
9		Encephalitis.		Prostate.	Diabetes mellitus.	Psychoses with cerebral arteriosclerosis.	Lead poisoning.
10			Puerperal septicemia.		Carious teeth. Diarrhea and enteritis. Gall bladder. Rickets.		Industrial dermatitis
11	Asthma and hay fever.	Poliomyelitis.	Acute rheumatic fever.		Cirrhosis of liver.	Epilepsy. Defective vision (uncorrected).	Industrial cancer.
12				High blood pressure. Varicose veins.		Alcoholic psychosis. Eye diseases. Neurasthenia.	CO poisoning. Underweight.
13		Erysipelas.			Hemorrhoids. Pellagra.	Senile psychosis.	

14	Tonsils—enlarged or diseased.	Smallpox.	Amoebic dysentery.		Constipation.		Benign tumors.
15	Chronic bronchitis.				Anemia.		Goiter.
16	Septic sore throat. Sinusitis.	Chicken pox.			Gallstones. Overweight.		
17	Enlarged adenoids.	Mumps.					
18-19	Deviated septum.		Septicemia (nonpuerperal).		Pyorrhea. Ulcers of stomach and intestines.		
20-21			Mycoses. Typhus fever.	Granular casts.			Adenitis. Cellulitis. Displacement of female genital organs.
22-23	Chronic nasopharyngitis.	Chancroidal infection.	Undulant fever.	Albumin in urine. Rapid pulse.	Gum abscess.		
24-25	Enlarged turbinates. Pleurisy.			Sugar in urine.			
26-27			Hookworm.		Malocclusion.		
28-29							Flat feet.
30-31					Mottled enamel.		

Index to rank of condition in specified graph (figure number)

	Rank in specified graph																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Abdomen, distended													15						
Abdominal girth, excessive											8								
Accidents																		3	
Accidents, automobile	8							22						4	1				
Adenitis												16	12						
Adenoids													8						
Albumin in urine											14	25							
Alcoholic psychosis										11									
Amoebic dysentery			17	9															
Anemia											18	12	6						
Appearance, fragile											7								
Appendicitis	13				17	4	5	13						7	7	1	4		
Appendix, tenderness region of												10							
Arteriosclerosis	11								3								8		
Asthma and hay fever									10		12								
Automobile accidents	8							22						4	1				
Blindness										6									
Blood pressure, high								19			4	4							
Bone defects due to rickets													1						
Bronchitis and colds					1	6	12	2								6			
Bronchitis, chronic									14		19								
Cancer	2					16			13		2			11	5	10	1	8	
Cancer, industrial																			4
Carbon monoxide poisoning																			5
Carious teeth, septic roots												1	2						
Casts, granular												11							
Cellulitis							17												
Cerebral arteriosclerosis, psychosis with										8									
Cerebral hemorrhage	5							11	7					16		18	5	7	
Chancroidal infections							18												
Chicken pox					11			23											
Childbirth, deaths and chronic conditions from and puerperal state	14													3		19	13		
Cirrhosis of liver	19														8			4	
Colds and bronchitis					1	6	12	2								6			
Congenital malformations and diseases of early infancy	7																11		
Constipation, history of												5							

Index to rank of condition in specified graph (figure number)—Continued

	Rank in specified graph																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Deaf-mutism										4									
Decayed teeth, septic roots												1	2						
Dementia praecox										1									
Dermatitis, industrial																			3
Diabetes mellitis	9							18	9					13	4		18		
Diarrhea and enteritis	10				9	11		16											
Diphtheria	23	4	9	10															
Displacement—female genital organs																	14		
Dysentery		8																	
Dysentery, amoebic			17	9															
Ear and mastoid diseases					7	15		14					4			5			
Early infancy, diseases of and congenital malformations	7																11		
Encephalitis		15	15	4															
Enteritis and diarrhea	10				9	11		16											
Epilepsy										10	3			14					
Erysipelas		13		8															
Eye diseases					13	14	8	24					7						
Flat feet												20							
Fragile appearance											7								
Gall bladder diseases	20								15							8			
Gall stones																	10		
Gastritis, etc	17				4	5	16	8	4					18		4			
General paralysis of insane										7									
Genital organs, displacement—female																	14		
Girth, abdominal, excessive											8								
Goiter and other thyroid								21				6					16		
Gonorrhea		17	6				1							22					
Granular casts												11							
Gum abscess													13						
Gum and teeth conditions					14														
Hay fever and asthma									10		12								
Heart diseases	1					8		7	2				14	5	3	13		6	
Heart, enlarged											6	23							
Heart, functional murmur											13								
Heart, organic valvular lesions											1	14							
Hemorrhoids							9					24							

Index to rank of condition in specified graph (figure number)—Continued

	Rank in specified graph																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Hernia and intestinal obstruction	15					10	3		16			17	19	17		15	6		
Homicide	16													6	9				
Hookworm infection												18							
Hypertrophic rhinitis												15							
Industrial cancer																			4
Industrial dermatitis																			3
Infancy, early, diseases of and congenital malformations	7																11		
Infantile paralysis		19	14	6													9		
Influenza and pneumonia	3	1	2		2	1	11	1						2		3			
Insanity. (See psychoses.)																			
Lead poisoning																			2
Liver, cirrhosis of	19														8			4	
Malaria	25	5	7				13							19					
Malformations, congenital and diseases of early infancy	7																11		
Malocclusion													17						
Manic depressive psychosis										5									
Mastoid, and ear diseases					7	15		14					4			5			
Mastoid process, diseases of																	2		
Measles		9	1	14	6			9											
Meningitis, meningococcic		14	16	3															
Mental defect										2			20						
Mental deficiency, psychosis with										9									
Mental diseases							15		5										
Mottled enamel on teeth												22							
Mouth breathing													9						
Mumps					12			20											
Mutism, deaf										4									
Mycoses		20																	
Nasal obstruction													10						
Nasopharyngitis, chronic												13	18						
Nephritis and other kidney	4					17		12	6					9	6	9		5	
Nervousness, neurasthenia					16	13		15	12			3	16			17			
Overweight											9	7							
Paralysis, general, of insane										7									
Paralysis, post poliomyelitis		19	14	6													9		
Paralysis, unspecified	5						11	7					16		18	5	7		

Index to rank of condition in specified graph (figure number)—Continued

	Rank in specified graph																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Paresis										7									
Pellagra			10											21					
Pleurisy											17								
Pneumoconiosis																			1
Pneumonia				5														2	
Pneumonia and influenza	3	1	2		2	1	11	1						2		3			
Poliomyelitis		19	14	6													9		
Prostate, diseases of	21											21					3		
Psychosis, alcoholic										11									
Psychosis with cerebral arteriosclerosis										8									
Psychosis, manic depressive										5									
Psychosis, with mental deficiency										9									
Psychoses (mental disease)							15		5										
Psychosis, senile										12									
Puerperal septicemia		10																	
Puerperal state (deaths and chronic conditions)	14													3		19	13		
Pulse, rapid											15								
Pyorrhea												9							
Rabies		23		1															
Rheumatic fever, acute		11												20					
Rheumatism, etc					8	2	10	4	1							7			
Rickets, bone defects due to													1						
Scarlet fever		12	4	13				17								20			
Septic sore throat			13																
Septicemia, nonpuerperal		13																	
Septicemia, puerperal	11																		
Septum, deviated							14					19							
Sinusitis					15											14			
Skin diseases					5	7	6	5								11			
Skin, industrial dermatitis																			3
Smallpox			11	11															
Sore throat, septic			13																
Stomach, gastritis, etc	17				4	5	16	8	4					18		4			
Stomach and intestines, ulcers of											11						15		
Sugar in urine											16								
Suicide	12													8	2				
Syphilis	18	3	3				4				10			12					

Index to rank of condition in specified graph (figure number)—Continued

	Rank in specified graph																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Teeth and gum conditions					14														
Teeth, carious, septic roots												1	2						
Tetanus		16		2															
Thyroid diseases								21				6					16		
Tonsillitis, etc	24				3	3	2	6						15		2			
Tonsils, enlarged or diseased												8	5						
Tuberculosis	6	2	8			12	7	3	8	3	5			1		16	17	1	
Turbinates, enlarged												15							
Tumors, benign	22															12	12		
Typhoid fever		7	12	7										10			7		
Typhus fever		21																	
Ulcers of stomach and intestines											11						15		
Underweight													3						
Undulant fever		22																	
Varicose veins						9			11										
Vision, defective—uncorrected												2	11						
Whooping cough		6	5	12	10			10											

Appendix

Explanatory references to the graphs

FIGURE 1

(a) From news release, United States Census Bureau, October 9, 1934. Primary causes. Whole country (all colors, both sexes, all ages).
(b) Includes diseases of coronary arteries.
(c) All forms.
(d) Includes cerebral embolism, thrombosis, hemiplegia.
(e) Diseases of early infancy and congenital malformations.
(f) Includes deaths resulting from collision with railroad trains and street cars.
(g) Exclusive of coronary arteries.
(h) Diseases of pregnancy, childbirth, and the puerperal state.
(i) Includes other diseases of stomach, exclusive of cancer.
(j) Includes other liver diseases.
(k) Includes unspecified.
(l) Diseases of pharynx and tonsils.

FIGURE 2

(c) From news release, United States Census Bureau, October 9, 1934. Primary causes. Whole country (all colors, both sexes, all ages).
(b) All forms.
(c) Term used in report is lethargic encephalitis.
(d) Acute.

FIGURE 3

(a) The Notifiable Diseases: Prevalence in States, 1933. Supplement No. 112 to Public Health Reports.
(b) These diseases are not reportable in many States. The rate is based on the States in which they are reportable.

(c) Estimated on basis of separate reports to Division of Venereal Diseases, United States Public Health Service.
(d) All forms.
(e) As the 1933 rate seemed abnormally low, the median 1928-32 was used instead for this disease.

FIGURE 4

(a) Corrected fatality rates in public-health practice. By Howard W. Green and George W. Moorehouse. Reprint No. 1354 from the Public Health Reports, January 24, 1930. (For all diseases in the graph with the exception of rabies, encephalitis, and amoebic dysentery.) Figure for rabies is based on the knowledge that no cases recover. Figures for encephalitis and amoebic dysentery are based on reports to the Public Health Service.
(b) All forms.

FIGURE 5

(a) Causes of illness in 9,000 families based on Nation-wide periodic canvasses, 1928-31. By Selwyn D. Collins. Reprint No. 1563 from the Public Health Reports, March 24, 1933.
(b) All forms.
(c) Includes laryngitis and throat illnesses; tonsillectomies.
(d) Gastritis, indigestion, and other stomach conditions; ulcers of stomach and intestines.
(e) Includes arthritis, neuralgia, neuritis, etc.
(f) Includes nervous exhaustion.

FIGURE 6

(a) Incidence of illness among male industrial employees in 1933 as compared with earlier years. By Dean K. Brundage. Public Health Reports, May 25, 1934. (Covers 152,203 male members of 38 sick-benefit associations.)
(b) All forms.
(c) Includes arthritis, neuralgia, neuritis, and sciatica.
(d) Diseases of the pharynx and tonsils.
(e) Diseases of the stomach (exclusive of cancer).
(f) Diseases of the veins.
(g) Neurasthenia and the like.

FIGURE 7

(a) Annual Report of the Surgeon General of the Public Health Service of the United States for the fiscal year 1934, page 104. Diagnostic groups were omitted where a large percentage of the cases appeared to result from injury. Classified according to major conditions for which admitted.
(b) Primarily operations.
(c) Diseases and injuries of.
(d) All forms.
(e) Arthritis.
(f) Psychiatric diseases.

FIGURE 8

(a) Based on unpublished material collected by the Committee on Costs of Medical Care. Surveys cover a period of 12 consecutive months, 1928-31. Excludes institutionalized cases. Cases of unknown number of days in bed allocated on basis of average for known duration. Figures include sole and primary diagnosis.
(b) All forms.
(c) Includes arthritis, neuralgia, neuritis, sciatica, lumbago, etc.
(d) Common disturbances of digestive tract; ulcers of stomach.
(e) Includes paralysis without specified cause.
(f) Includes nervous exhaustion.

FIGURE 9

(a) Cancer and other chronic diseases in Massachusetts. By Geo. H. Bigelow and Herbert L. Lombard. Houghton Mifflin, Boston, 1933. Based on appendix table 26, giving estimated volume of chronic disease in Massachusetts, 1929-31.
(b) Digestive diseases.
(c) Apoplexy.

FIGURE 10

(a) Forty-fifth annual report of the Department of Mental Hygiene, July 1, 1932 to June 30, 1933. State of New York Legislative Document (1934), No. 29. Number in institutions on June 30, 1933. For specific diagnoses of psychoses, the number of cases on June 30, 1933, was available only for the civil State hospitals. Consequently a correction was made on the basis of the total number of patients with various diagnoses under treatment during the year in civil State hospitals and the total number in all mental institutions conducted or inspected by the department of mental hygiene.

(b) Average number of patients in tuberculosis hospitals in New York State during 1934. From Hospital Number, Journal of American Medical Association, March 30, 1935.

(c) From Statistical Abstracts of the United States, 1934. United States Bureau of Foreign and Domestic Commerce. Number enumerated April 1, 1930.

FIGURE 11

(a) The physical impairments of adult life: Association with subsequent rates of mortality. Studies in the diseases of adult life no. 9. By Rollo H. Britten. Journal Preventive Medicine, vol. 6, no. 4, p. 249, July 1932. Based on medical impairment study, compiled and published by the Joint Committee on Mortality of the Association of Life Insurance Medical Directors and the Actuarial Society of America, 1929. The ratios are of actual and expected mortality among persons found to have specific impairments at the time of their applicant examination for life insurance (or giving a history of such impairments). In calculating these ratios, the age and the number of years of policy life were taken into account.

(b) Substandard policies (i. e., for persons paying a higher premium because of serious physical impairment).

(c) History of operation.

(d) History or found on examination.

(e) Five mm or more above average for age. If a more severe standard had been set, the ratio would have been much greater.

(f) Lungs unsatisfactory, dullness, prolonged expiration, or suspicious apices.

(g) Without murmur.

(h) Abdominal circumference markedly greater than expanded chest (0-29 percent over average weight for height and age).

(i) Fifty pounds or more over average weight for height and age (men). The ratio is estimated from a supplementary study by the joint committee (supplement to impairment study, 1929).

(j) History.

(k) Does not include hay fever.

(l) One hundred or more beats per minute.

(m) Hemoglobin, 60 to 80 percent.

FIGURE 12

(a) The physical impairments of adult life. General results of a statistical study of medical examinations by the Life Extension Institute of 100,924 white male life-insurance policyholders since 1921. Studies in diseases of adult life no. 1. By Edgar Sydenstricker and Rollo H. Britten. American Journal of Hygiene, volume 11, no. 1, page 73, January 1930.

Sex differences in the physical impairments of adult life. A comparison of rates among men and women, based on 112,618 medical examinations by the Life Extension Institute. Studies in diseases of adult life no. 7. By Rollo H. Britten. American Journal of Hygiene, volume 13, no. 3, page 741, May 1931.

The figures are averages of the rates for men and women for all ages (adults), exclusive of examinations made in the head offices. Data for certain impairments were based on special tabulations not included in these reports; these are indicated in footnotes.

(b) Because of the fact that slight degrees of certain types of impairments are likely to be noted on physical examination, a correction was made. This correction was based on the fact that, in the case of certain impairments for which the degree was specified, the ratio of marked to total averaged about 0.18. The prevalence rate for the impairments carrying note (b) were multiplied by 0.18 to make them more comparable with the other conditions.

(c) Twenty mm and more above average for age. Average for ages 30-39 and 45-64. (From special tabulation.)

(d) Twenty-five percent and more over the average weight for height (estimated from special tabulation).

(e) Below 70 percent hemoglobin (estimated from special examinations).

(f) Based on estimated number of persons (from other sources).

FIGURE 13

(a) Physical status of preschool children, Gary, Ind. By Anna E. Rude. United States Children's Bureau Publication No. 111. 1922.

(b) Because of the fact that slight degrees of certain types of impairments are likely to be noted on physical examination, a correction was made. This correction was based on the fact that in the case of certain impairments for which the degree was specified on special examination (see footnote (b) under fig. 12), the ratio of marked to total averaged about 0.18. The prevalence rates for the impairments carrying footnote (b) were multiplied by 0.18 to make them more comparable with the other conditions.

(c) Ten percent or more below the average for height and age.

(d) Including "questionable."

(e) Apparent or suspected.

FIGURE 14

(a) Mortality Statistics 1932. United States Bureau of the Census. (All colors, both sexes.)
(b) All forms.
(c) Diseases of pregnancy, childbirth, and the puerperal state.
(d) Includes deaths resulting from collision with railroad trains and streetcars.
(e) Includes diseases of coronary arteries.
(f) Includes other malignant tumors.
(g) Includes pharyngitis, laryngitis, and similar causes.
(h) Includes cerebral embolism, thrombosis, and hemiplegia.
(i) Includes other diseases of stomach except cancer.
(j) Includes other venereal diseases (except syphilis).

FIGURE 15

(a) From news release of Bureau of Census, covering mortality by cause in registration States of 1920 Median rates for two periods are contrasted—1924–26 and 1927–33.
(b) The greatest percentage increase was actually shown for epidemic cerebrospinal meningitis; but since the mortality for the years immediately prior to 1920 (utilizing data for registration States of 1910) was greater than for the years 1927–33, it has been omitted from the graph.
(c) Includes collision with railroad trains and streetcars.

FIGURE 16

(a) The incidence of illness and the receipt and costs of medical care among representative families. Experiences in 12 consecutive months during 1928–31. By I. S. Falk, Margaret C. Klem, and Nathan Sinai. Publication of the Committee on the Costs of Medical Care No. 26. University of Chicago Press, Chicago, 1933. (Excludes institutional care, confinements, etc., care of the teeth, and care of eyes.)
(b) Includes appendectomy.
(c) Includes tonsillectomy, pharyngitis, and laryngitis.
(d) All forms.
(e) Common disturbances of the digestive tract; includes ulcers of the stomach and intestines.
(f) Includes arthritis, neuralgia, neuritis, sciatica, lumbago, etc.
(g) Includes tumors and cysts of female genital organs.
(h) Includes nervous exhaustion.
(i) Includes paralysis without specified causes.

FIGURE 17

(a) The incidence of illness and the receipt and costs of medical care among representative families. Experiences in 12 consecutive months during 1928–31. By I. S. Falk, Margaret C. Klem, and Nathan Sinai. Publication of the Committee on the Costs of Medical Care No. 26. University of Chicago Press, Chicago, 1933. (Excludes institutional care, confinements, etc., care of teeth and care of eyes.)
(b) Includes other malignant tumors.
(c) Includes appendectomy.
(d) Includes paralysis without specified cause.
(e) Includes paralysis resulting from poliomyelitis.
(f) Includes premature birth, injury at birth, and congenital debility.
(g) Includes tumors and cysts of female genital organs.
(h) Includes leucorrhea.
(i) All forms.

FIGURE 18

(a) Mortality rates by occupational class in the United States. By Rollo H. Britten. Reprint No. 1648 from the Public Health Reports, Sept. 21, 1934. The data are for 10 States. (Original source is "Death rates by occupation, based on data of the United States Census Bureau, 1930." Edited by Jessamine S. Whitney. Published by the National Tuberculosis Association.) The 10 States are Alabama, Connecticut, Illinois, Kansas, Massachusetts, Minnesota, New Jersey, New York, Ohio, and Wisconsin. The ratios are based on rates adjusted for age. All other causes has a ratio of 165.
(b) Respiratory system.
(c) All forms.
(d) Includes traumatism by fall, absorption of poisonous gas, and burns (conflagration excepted).
(e) Includes softening of the brain.
(f) Includes other malignant tumors.

FIGURE 19

(a) Number of articles published and abstracted in Journal of Industrial Hygiene from 1931 to 1934 inclusive, were tabulated according to the occupational disease under discussion.

MALARIA-CONTROL ACTIVITIES OF THE TENNESSEE VALLEY AUTHORITY*

By E. L. Bishop, M. D., *Director of Health, Tennessee Valley Authority*

The regional planning which provides improvement of navigation, land reclamation, flood control, and power potentialities impinges upon malaria problems because of changes in conditions which modify shore-line characteristics and create quiet water. For this reason the Tennessee Valley Authority must carefully plan the measures essential for prevention of any mosquito production that would increase malaria transmission along its 2,300 miles of impounded reservoir shore line. These measures are being closely considered by every element of the enterprise. It is doubtful that any stream-development program has ever had better coordination of efforts for malaria prevention, and mention of a few of the relationships established through this planning should demonstrate the value of such an approach.

The design of the Wheeler Dam was changed at the very beginning of construction to provide such alteration in the height of the gates as would permit the seasonal and periodic fluctuation of water level essential to the maintenance of clean shore line and a minimum condition of mosquito (*Anopheles*) production. Since that time the design of each new dam provides a malaria surcharge which is agreed upon between the engineers and those of us responsible for malaria control.

In reservoir-clearance operations, surveys are made by our sanitary engineers before clearance begins and throughout this work a resident engineer detailed from the health section is on duty with the clearance forces. Thus the Authority, while fulfilling its obligation to aid navigation and control floods, is doing so in such a manner as also to facilitate the control of mosquito production. Marginal clearance is frequently of a modified type which leaves certain growths [1] standing, but clears all small growth and overhanging limbs. The operation as a whole is synchronized insofar as possible with the needs for mosquito control, and when this is not possible the areas are rebrushed wherever necessary.

The impoundage schedule is agreed upon in general conferences of all parts of the Authority that have a specific interest, and this includes the Health Section. No reservoirs will be filled during the mosquito-breeding season. While simple in statement, this part of planning is difficult and may well provide real complications in engineering services

*Read before Florida Public Health Association Meeting, Orlando, Fla., Dec. 4, 1935.

[1] Such as willow, gum, and cypress.

Projects relating to the development of fish and game preserves clear through the planning council, upon which the health section is represented. In addition, a representative of the section serves on a joint committee with the Forestry Division in the preliminary discussions. Thus the optimum result in production of fish with the greatest effect upon the prevention of mosquito production is possible.

In studies carried out by the Project Planning Division to develop a schedule of operations to secure optimum results for flood control and navigation provision has been made for the water-level fluctuation essential to control of mosquito production. This also includes distribution of load between possible power developments so that reservoir levels can be alternately raised and lowered. The planning has therefore already extended into the operating stage and makes possible a synchronized operation to provide fluctuation for malaria control.

Preparation and plans by the Health Section have included studies of existing conditions, probable conditions after impoundage, studies of control procedures, and the beginning of some basic research. It may be sketched briefly as follows:

(1) In addition to the field-control forces and the resident engineers on the reservoirs, a malaria unit consisting of a malariologist, an engineer trained in impounded water-control procedures, an entomologist, and a limnologist has been organized at Wilson Dam and provided with essential laboratory and other facilities for its work. Administratively the work of this group clears through the medical officer in charge to an epidemiologist and senior sanitary engineer of the central office.

(2) Base-line surveys of the prevalence of infection and of the extent and kind of anopheline breeding have been made for each reservoir area where a dam is under construction. The first infection survey of an area has consisted essentially of blood smears taken from as nearly every fifth family as possible in order that not less than a 10-percent sample might be available for studies. In addition, each house of the area is plotted on maps prepared in accurate detail from airplane mosaics, and a household census is taken. *Anopheles* catching stations are established in such manner as to give a representative cross section of the area, and regular catches are made at each station throughout the breeding season.

The result is a well-mapped area and data showing the preimpoundage conditions with sufficient accuracy to guide the beginning of control operations. Subsequent surveys of infection will, of course, be made, though these will be of a different type and confined mainly to spleen and blood studies of school children; a course of procedure made possible by the accuracy of mapping and the detail with which population data are secured. In passing, it is interesting to note that

the fifth family survey (1934) of Wheeler Reservoir, which is made up of the basin proper and that area lying within 1 mile of the high level contour, showed 27.1 percent of all blood smears taken from the rural population positive for malaria, 19.6 percent showing *P. vivax*, and 67.4 percent *P. falciparum*. A recent survey (1935) of Pickwick Reservoir area shows a much lower total rate and an exceedingly low rate in the Miocene sand and gravel area of Mississippi and Tennessee. The principal infection is found in the limestone areas of north Alabama.

The area lying within 1 mile of the Lake Wilson shore line was also surveyed by the fifth family method, and the resulting sharp localization of our control problems demonstrated the usefulness of accurate knowledge regarding the distribution of infection. We are, therefore, sparing no effort to obtain similar knowledge concerning the pools yet to be impounded. Here the accuracy of the mapping operations will very probably permit the use of less costly survey methods.

(3) Studies for the development of more efficient means of applying larvicides, of more effective larvicides, and of natural factors influencing breeding conditions have been begun and are being extended in the hope that less costly control measures may be found, or that present methods can be modified with similar results. Attention is also directed to more efficient designing and operation of boats and power apparatus, and considerable work has been done in the study of airplane dusting of both the acreage and shore-line types. Accurate cost records have been kept, and a close check of the effectiveness of control has been maintained. Thirty-three miles of shore line on Lake Wilson and 120 acres of spring-fed natural swamp and lake area were set aside for this study. Costs on shore line dusting compared favorably with costs of other methods of application,[2] but this type of flying is quite dangerous and the effectiveness of control as yet inadequately demonstrated. Supplementary studies will be carried out next season. The results of acreage dusting were more encouraging. Reasonably adequate reductions in breeding were secured at costs comparing quite favorably with other methods of distribution [3] and use of this method in routine control procedure appears warranted. The experiment has been reported in detail by our staff at the recent meeting of the National Malaria Committee.[4]

In addition to this work, studies of the effect of dense shade on mosquito production are proceeding through the reservation of certain areas for experimental purposes. Here the smaller growths are

[2] $103.80 per season per mile for airplane distribution and $130.20 per season per mile for oiling by boat.

[3] $1.22 an acre for airplane dusting, as compared with $2.20 an acre for hand and boat dusting and $.282 for oiling.

[4] Observations on airplane dusting. By Dr. R. B. Watson.

removed and growths of gum and cypress left standing in water a few feet deep. Parallel studies of the possibilities of reforestation with these woods are going forward, some thousands of young trees having been planted. Shore-line improvements through diking, secondary dams, drainage, and similar measures is also claiming attention with a view of reducing to a minimum the area requiring larvicidal control, always a costly and relatively inefficient procedure.

(4) Studies more definitely research in character have been planned and some phases of these studies have been begun. For example, we need to know more concerning the strains of parasites causing infection; we should have more specific information concerning the habits and breeding conditions of *A. quadrimaculatus* in our region; clinical studies of malaria in our population may afford useful information; and a study of the biology of our reservoirs prior to, during, and after impoundage may well provide us with measures of practical value.

(5) The design and construction of equipment for control operations is instituted well in advance of the need. Estimates are now being prepared for the Wheeler Reservoir area, though impoundage here is not expected until the fall of 1936, and extensive control service therefore will not be required until the spring of 1937. Boats and power equipment for oiling and dusting are already available on Norris Lake, though this impoundage will not be completed until the winter and spring seasons of 1935 and 1936. The foreman for this area, already experienced in impounded-water work, was given additional training last summer and is now in reserve on forestry work.

With reference to actual control procedures organized for routine service, Lake Wilson has been the only basin where continuing activity has been in effect, since it is the only lake under the administration of the Authority where impoundage has been completed. Work here has had a double purpose: First, the adequate control of mosquito production, and, second, experimentation in an effort to develop effective and economical methods for the pools yet to be impounded. It was here we carried on the experiment in shore line dusting by airplane, and here also we proved that mosquito production could be controlled with a constant water elevation at the high level contour when the costs of additional measures were offset by economy elsewhere. Actually, the saving effected in dredging operations because of the constant level amounted to many times the extra costs for mosquito control. Lake Wilson has also been used as a training station for personnel being developed for supervisory responsibilities on other pools. Young engineers serve as inspectors on the experimental work, and the more promising individuals are transferred to control services after they have demonstrated ability.

Perhaps the most fundamental accomplishment yet achieved has been the coordination of our service with that of other agencies, in-

cluding State and local health departments, other Federal organizations, and private agencies. Present relationships indicate the extent of correlation and may be summarized as follows:

(1) A board of consultants has been formed which includes three officers of the United States Public Health Service, an entomologist from the Bureau of Entomology of the Department of Agriculture, and a malariologist of the Rockefeller Foundation. Each member represents essentially a particular aspect of malaria work, though all are broadly experienced in several or all aspects. To this board has been given the functions of expert consultation, critical review, and final appraisal in relation to our existing control services, and the planning of new services. Its findings are final. At least one full meeting is held each year, and individual members are called in consultation as frequently as new problems arise or modification of existing procedure becomes essential. The total time given by the members individually and collectively amounts to a very considerable figure, and the relationship is sufficiently definite and formal to be a determining factor in our plans and procedure. We are convinced that the correlation of the staff service with the mature judgment of broadly experienced experts will afford an interesting and exceedingly valuable example of group thinking and group judgment.

(2) State and local health departments have been brought into the whole health and sanitation program through the simple media of contracts for service and specific agreements concerning joint malaria control programs. The contracts for service extend certain financial consideration from the Authority through the State health agency to the local health department, provided certain service obligations are undertaken by those organizations. In this manner, coordination of procedure is secured, duplication is avoided, the health agencies are strengthened, and the control procedures fortified by the authority of the State and local governments. All regional planning within a particular State is of course, accomplished in cooperation with State agencies.

The second medium, agreement on program, is made specific through the preparation of written statements carrying all essential detail. The actual job of preparing the statement of plans and program is accomplished through joint conferences of the field staffs and approved by executive action only after complete agreement has been reached in the field. Under such arrangements a partnership of service becomes possible. Any other system would permit only separate action.

The advantages of the arrangement are very definite. A second line of defense against increased prevalence of malaria is at once available. Immediately this affords the opportunity for much broader control procedure, including such items as major and minor drainage

of areas contiguous to the pools, improvement of housing and mosquito-proofing services, the establishment of an intelligence service through improvement of morbidity reporting, extension of research studies, and an infinite variety of other activities of mutual interest.

When it is realized that more than 1,000 lime sink pounds exist around the 3 reservoirs in Alabama, Mississippi, and West Tennessee, that housing conditions in many instances are such as to preclude really adequate mosquito proofing, and that morbidity reporting as yet is but incompletely developed, the need for cooperative effort and joint service should be readily apparent.

(3) Cooperation in the training of personnel has been extended by the Rockefeller Foundation and by official agencies, through a fellowship grant from the former and through use of the malaria station facilities of both. In addition, the members of the board of consultants have given freely of their efforts in this part of our work.

(4) Health education is conceded an important place in malaria control by everyone who has faced the practical problems under the usual field conditions. This, too, is an important element of our cooperative arrangements, for a staff member of the health section has developed methods for use by the schools and health agencies which are apparently as useful as any yet developed in this region. The methods are being followed by the local school and health services of the area, and the result seems to be a community "malaria consciousness" heretofore unrealized.

SUMMARY

The unusual combination of facilities existing in the Tennessee Valley Authority and the point of view of this organization in regard to malaria, together with the extent to which the activity in malaria control has been and is being correlated with that of other agencies, has made possible what is thought to be a somewhat unusual development in planning an approach to control of the disease on a regional basis. Present objectives and aims may be briefly stated as defining the problem in relation to extent of infection and characteristics of the vector and infecting agent; the reaction upon the host; investigation of biological conditions which may influence transmission; surveys of environmental conditions and so changing these conditions as to decrease the need for larvicidal agents in controlling transmission. Many of the conditions will probably be related to shore-line improvement, county programs of drainage, better housing, mosquito proofing, and such health education as may stimulate an increasing public cooperation.

RAT-BITE FEVER SPIROCHETES IN NATURALLY INFECTED WHITE MICE, *MUS MUSCULUS*[1]

By EDWARD FRANCIS, *Medical Director, United States Public Health Service*

Dark-field examination of human material for rat-bite fever may fail to demonstrate the spirochetes, but when such material is injected into white mice, white rats, or guinea pigs, multiplication may render the organisms readily visible by dark-field examination of the animal's blood. The white mouse is the most susceptible experimental animal for this organism; but caution is necessary when using white mice, as the animals may be already naturally infected.

Robertson [2] has made the only reference which I have seen in the literature to natural infection of white mice. He states that, on four occasions since 1924, he has discovered spontaneous infection of rat-bite fever in laboratory mice which were either stock animals or were carrying some other parasite (*Trypanosoma cruzi* or *Treponema recurrentis*).

I had an experience similar to that of Robertson. On December 19, 1935, and again on December 20, a stock white mouse was allowed to ingest 2 dozen living bed bugs immediately after they had fed to engorgement on a mouse whose blood was rich in relapsing fever spirochetes. On December 21 his blood showed a heavy infection with rat-bite fever spirochetes, but he did not become positive for relapsing fever spirochetes until December 23. This suggested an examination of the remaining stock mice, of which there were only 8; 6 of these were found infected with rat-bite spirochetes by dark-field examination of the tail blood.

Subsequent examination was made of samples of each lot of fresh white mice as they were furnished to the National Institute of Health by four dealers. Tests indicated that three of the dealers were supplying mice free from this infection; but on April 14, 1936, of 150 white mice received from the fourth dealer, 45 were found infected with rat-bite spirochetes by dark-field examination of tail blood, and 105 were negative.

A single preparation was made from each mouse and about 10 minutes were devoted to its examination, using a high-dry objective, without funnel stop, and a dark-field substage condenser. The numbers of spirochetes per single preparation of 45 positive mice were 31, 30, 52, 14, 30, 6, 20, 40, 60, 15, 1, 3, 15, 21, 2, 60, 10, 25, 3, 26, 20, 10, 10, 8, 3, 30+, 27, 30+, 10, 9, 12+, 5, 11, 30+, 4, 29+, 13, 14, 11, 3, 28+, 21, 3, 25+, and 23.

Between April 14 and June 22, 1936, a second examination was made of the 105 mice which were negative on the first examination but

[1] From the National Institute of Health, Washington, D. C.

[2] Robertson, Andrew: Rat-bite fever. Ann. Trop. Med. and Parasit., 24: 367 (1930).

which were kept together in one lot. Of these, 20 were found infected, the number of spirochetes per single dark-field preparation of 20 positive white mice being 5, 9, 19, 8, 50, 25, 70+, 45+, 70+, 10, 30, 70, 60+, 17, 19, 5, 26, 28, 5, and 6. This second examination demonstrates how misleading a single examination may be, and how rapid the spread of infection may be in a lot of white mice known to be infected.

The term "jobber" is more appropriate for the fourth dealer because he did not maintain a stock of breeders but bought his mice in small numbers from various miscellaneous individuals in Pennsylvania.

Trained bacteriologists may fail to recognize the rat-bite spirochete when seen for the first time in the dark field. The eye which is trained to the form and movements of *Treponema pallidum* may readily overlook a typical rat-bite spirochete, mistaking it for a motile darting bacillus, especially when the preparation is freshly made or when the organisms are few. After the preparation has stood for perhaps half an hour, the slowed movements permit the spiral form and terminal flagellum at each end to be plainly seen.

The lesson is obvious that before inoculating from a patient to white mice one should be sure that his mice are free from natural infection, or he should avoid the use of white mice in favor of white rats and guinea pigs. In the case reported by Francis [3] inoculation was made from the patient's lymph node to a white rat and then to guinea pigs for three generations.

POLIOMYELITIS IN ALABAMA

The outbreak of poliomyelitis in Alabama by mid-July involved about 10 counties in the northwestern corner out of the 67 counties in the State. It had spread to three adjoining counties in Tennessee to a slight extent. In general, the outbreak appears to be comparable to that which occurred in north central North Carolina last year in intensity, mildness of the individual cases, high proportion of rural cases, and low-age distribution. It is presumably a favorable indication that the Alabama outbreak became apparent some 4 weeks later in the season than did the outbreak in North Carolina.

[3] Francis, Edward: Rat-bite fever and relapsing fever in the United States. Trans. Asso. Am. Physicians, 1932, 47: 143.

STATEMENT REGARDING NASAL SPRAY AS PREVENTIVE OF POLIOMYELITIS

The recent experimental work by Drs. Armstrong and Harrison in preventing poliomyelitis in monkeys by the use of a nasal spray has excited so much interest and speculation that the Public Health Service deems it desirable to issue the following statement:

The evidence regarding this method is as yet based entirely upon animal experimentation and the proposed spray is not at present to be regarded as of proved value in the prevention of poliomyelitis in man. It may be advisable to await the results of further trials before giving the method general application. If, however, it is desired to use the solution, it should be sprayed into the nostrils three or four times on alternate days, and thereafter weekly during the presence of poliomyelitis. The spray tip should be pointed upward and backward at an angle of about 45°, and the spraying should be thorough enough to reach the pharynx as well, when a bitter taste will be noted. The early applications at least should be administered by a physician. The experimental work on animals is still being pursued. The tentative procedure is, therefore, subject to such changes as may be dictated by future findings.

The most effective solution so far developed during experimentation on monkeys is prepared as follows:

Solution A: Dissolve 1 gram of picric acid in 100 cc of physiological salt solution (0.85 percent). (Warming facilitates solution of the picric acid.)

Solution B: Dissolve 1 gram of sodium aluminum sulphate (sodium alum) in 100 cc of physiological salt solution (0.85 percent). Any turbidity in this solution should be removed by filtering one or more times through the same filter paper.

Mix solutions A and B in equal amounts. The resulting mixture, which contains 0.5 percent picric acid and 0.5 percent alum is sufficiently antiseptic to prevent the growth of organisms and is ready for use as a spray. Homemade concoctions are not favored.

DEATHS DURING WEEK ENDED JUNE 27, 1936

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended June 27, 1936	Corresponding week, 1935
Data from 86 large cities of the United States:		
Total deaths	7,818	7,513
Deaths per 1,000 population, annual basis	10.9	10.5
Deaths under 1 year of age	560	542
Deaths under 1 year of age per 1,000 estimated live births	51	50
Deaths per 1,000 population, annual basis, first 26 weeks of year	12.9	12.2
Data from industrial insurance companies:		
Policies in force	68,470,070	67,900,773
Number of death claims	11,653	12,274
Death claims per 1,000 policies in force, annual rate	8.9	9.4
Death claims per 1,000 policies, first 26 weeks of year, annual rate	10.6	10.4

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers

Reports for Weeks Ended July 4, 1936, and July 6, 1935

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended July 4, 1936, and July 6, 1935

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended July 4, 1936	Week ended July 6, 1935	Week ended July 4, 1936	Week ended July 6, 1935	Week ended July 4, 1936	Week ended July 6, 1935	Week ended July 4, 1936	Week ended July 6, 1935
New England States:								
Maine					169	81	1	0
New Hampshire		1			2	3	0	0
Vermont					58	41	0	0
Massachusetts	1	5			460	166	1	0
Rhode Island		3			3	201	0	0
Connecticut	2	11	1		78	223	0	1
Middle Atlantic States:								
New York	33	27	[1] 1		1,307	1,333	11	11
New Jersey	3	17	1	2	262	635	1	0
Pennsylvania	43	33			616	644	5	3
East North Central States:								
Ohio	11	21	6	1	197	743	1	4
Indiana	7	12	7	8	15	28	1	0
Illinois	29	39	3	13	17	800	8	11
Michigan	10	6	1		29	748	7	0
Wisconsin	1	1	8	11	102	942	0	4
West North Central States:								
Minnesota		1			72	8	0	0
Iowa	5	3			6	13	0	1
Missouri	3	14	11	14	8	39	0	4
North Dakota		1		17	1	1	1	0
South Dakota	2	3			5	42	0	0
Nebraska	3	1			14	40	1	0
Kansas	6	5	3			55	0	2
South Atlantic States:								
Delaware	5				7	5	0	0
Maryland [2]	3	4	1	4	186	32	7	2
District of Columbia [2]	14	7		1	57	20	0	2
Virginia [3]	4	6			89	76	9	3
West Virginia	4	14	3	7	15	84	2	0
North Carolina [3] [4]	8	4			15	8	4	2
South Carolina [4]	1	3	37	27	14	5	1	1
Georgia [4]	3	3					2	1
Florida [4]	1	1			6	9	1	0

See footnotes at end of table.

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Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended July 4, 1936, and July 6, 1935—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended July 4, 1936	Week ended July 6, 1935	Week ended July 4, 1936	Week ended July 6, 1935	Week ended July 4, 1936	Week ended July 6, 1935	Week ended July 4, 1936	Week ended July 6, 1935
East South Central States:								
Kentucky	3	4	1	7	7	53	4	2
Tennessee [3]	5	8	33	3	35	18	4	2
Alabama [4]	5	16	3	15	8	24	0	1
Mississippi [3]	5	4	----	----	----	----	1	0
West South Central States:								
Arkansas	3	3	6	2	----	2	0	2
Louisiana	1	11	9	15	11	4	0	1
Oklahoma [3]	5	6	12	17	7	56	0	6
Texas [4]	21	17	63	39	86	49	0	3
Mountain States:								
Montana [3]	----	3	----	----	8	38	0	0
Idaho [3]	1	----	----	1	----	3	0	0
Wyoming [3]	1	----	----	----	1	15	0	0
Colorado [3]	2	5	----	----	10	66	0	1
New Mexico	4	2	3	----	18	2	0	0
Arizona	3	1	25	3	27	1	0	0
Utah [3]	1	----	----	----	36	6	0	0
Pacific States:								
Washington	1	1	----	----	97	103	1	5
Oregon	----	----	4	4	14	66	0	1
California	24	20	444	20	1,467	477	4	2
Total	287	347	686	231	5,642	7,708	78	78
First 27 weeks of year	13,385	15,878	140,399	102,548	259,498	675,961	5,536	3,708

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended July 4, 1936	Week ended July 6, 1935	Week ended July 4, 1936	Week ended July 6, 1935	Week ended July 4, 1936	Week ended July 6, 1935	Week ended July 4, 1936	Week ended July 6, 1935
New England States:								
Maine	0	1	6	16	0	0	0	1
New Hampshire	0	0	1	6	0	0	0	0
Vermont	0	0	15	1	0	0	0	0
Massachusetts	0	1	74	105	0	0	2	2
Rhode Island	0	1	6	1	0	0	0	1
Connecticut	0	0	14	23	0	0	0	0
Middle Atlantic States:								
New York	3	11	293	286	0	0	8	7
New Jersey	1	0	80	41	0	0	3	3
Pennsylvania	1	0	379	209	0	0	14	12
East North Central States:								
Ohio	0	1	98	113	0	2	9	25
Indiana	1	0	27	22	1	3	0	8
Illinois	2	2	235	303	17	1	6	12
Michigan	0	2	204	102	0	2	5	10
Wisconsin	0	1	136	199	9	19	2	5
West North Central States:								
Minnesota	0	1	61	74	13	7	2	22
Iowa	0	0	41	24	7	10	2	0
Missouri	1	1	26	15	6	1	6	12
North Dakota	0	0	3	9	3	1	0	0
South Dakota	0	1	15	10	4	6	0	2
Nebraska	0	0	16	9	10	17	0	0
Kansas	0	1	51	23	2	4	5	5
South Atlantic States:								
Delaware	0	0	----	3	0	0	0	2
Maryland [3]	0	1	24	18	0	0	2	4
District of Columbia [3]	0	0	9	12	0	0	0	0
Virginia [3]	1	28	13	8	0	0	1	11
West Virginia	1	1	20	25	1	0	2	8
North Carolina [3] [4]	0	55	5	15	0	0	6	27
South Carolina [4]	0	0	2	2	0	0	9	29
Georgia [4]	3	0	4	----	0	0	22	19
Florida [4]	1	2	2	5	0	0	0	4

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended July 4, 1936, and July 6, 1935—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended July 4, 1936	Week ended July 6, 1935	Week ended July 4, 1936	Week ended July 6, 1935	Week ended July 4, 1936	Week ended July 6, 1935	Week ended July 4, 1936	Week ended July 6, 1935
East South Central States:								
Kentucky	1	0	14	----	0	1	16	16
Tennessee [2]	1	5	18	11	0	0	17	30
Alabama [4]	36	2	7	8	0	0	10	32
Mississippi [2]	0	0	4	5	0	0	15	9
West South Central States:								
Arkansas	0	0	----	3	0	4	4	17
Louisiana	0	3	5	1	0	0	20	6
Oklahoma [5]	1	1	10	1	0	0	11	19
Texas [4]	0	2	13	14	0	4	35	43
Mountain States:								
Montana [3]	0	0	14	9	19	9	2	3
Idaho [3]	0	0	2	4	2	0	3	0
Wyoming [3]	0	0	11	7	0	8	0	0
Colorado [3]	0	0	26	40	2	3	0	2
New Mexico	0	0	23	7	0	0	7	8
Arizona	0	0	2	6	0	0	3	0
Utah [3]	0	0	19	37	8	0	3	0
Pacific States:								
Washington	0	0	14	17	3	15	14	1
Oregon	0	0	7	18	2	3	9	6
California	7	32	152	79	3	4	5	3
Total	61	156	2,201	1,946	112	124	280	426
First 27 weeks of year	569	1,181	176,884	173,424	5,862	4,976	3,897	5,009

[1] New York City only.
[2] Week ended earlier than Saturday.
[3] Rocky Mountain spotted fever, week ended July 4, 1936, 12 cases, as follows: Maryland, 1; District of Columbia, 1; Virginia, 1; North Carolina, 2; Tennessee, 3; Montana, 1; Idaho, 1; Wyoming, 1; Colorado, 1.
[4] Typhus fever, week ended July 4, 1936, 60 cases, as follows: North Carolina, 1; South Carolina, 1; Georgia, 22; Florida, 6; Alabama, 18; Texas, 12.
[5] Exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following reports of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week.

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
May 1936										
Hawaii Territory	----	11	92	----	20	----	0	1	0	2
New York	79	161	----	6	13,412	----	5	3,224	0	39
June 1936										
Arkansas	1	6	24	146	14	30	0	6	0	15
Connecticut	6	9	5	1	667	----	0	155	0	5
District of Columbia	8	73	----	----	493	----	0	37	0	2
Iowa	6	11	----	2	18	----	0	393	60	5
Nebraska	1	12	3	----	65	----	0	143	72	0
South Carolina	----	58	181	976	84	162	1	5	5	28

May 1936	Cases
Hawaii Territory:	
Chickenpox	63
Dysentery (amebic)	5
Leprosy	6
Mumps	18
Paratyphoid fever	1
Typhus fever	1
Whooping cough	75
New York:	
Chickenpox	1,961
Dysentery (amebic)	2
Dysentery (bacillary)	22
Epidemic encephalitis	14
German measles	1,255
Opthalmia neonatorum[1]	15
Paratyphoid fever	4
Rabies in animals [1]	5
Septic sore throat	52
Tetanus	6
Trichinosis	15
Undulant fever	16
Vincent's infection [1]	53
Whooping cough	1,013
June 1936	
Anthrax:	
Connecticut	1
Chickenpox:	
Arkansas	27
Connecticut	384
Chickenpox—Continued.	
District of Columbia	34
Iowa	90
Nebraska	60
South Carolina	50
Conjunctivitis, infectious:	
Connecticut	7
Dengue:	
South Carolina	2
Diarrhea:	
South Carolina	699
Epidemic encephalitis:	
District of Columbia	1
South Carolina	1
German measles:	
Connecticut	1,343
Hookworm disease:	
South Carolina	58
Mumps:	
Arkansas	62
Connecticut	319
Iowa	151
Nebraska	54
South Carolina	109
Ophthalmia neonatorum:	
Connecticut	1
South Carolina	2
Paratyphoid fever:	
Arkansas	1
Connecticut	5
South Carolina	9
Rabies in animals:	
South Carolina	27
Rocky Mountain spotted fever:	
District of Columbia	2
Septic sore throat:	
Connecticut	9
Nebraska	5
Tetanus:	
Connecticut	1
South Carolina	2
Trichinosis:	
Connecticut	2
Tularemia:	
Arkansas	1
District of Columbia	1
South Carolina	1
Typhus fever:	
South Carolina	3
Undulant fever:	
Arkansas	7
Connecticut	12
District of Columbia	1
Iowa	13
Whooping cough:	
Arkansas	15
Connecticut	206
District of Columbia	134
Iowa	60
Nebraska	14
South Carolina	53

[1] Exclusive of New York City.

PLAGUE INFECTION IN LASSEN, MODOC, AND SANTA CRUZ COUNTIES, CALIF., AND BONNEVILLE COUNTY, IDAHO

The Director of Public Health of California has reported positive findings for plague in 4 Oregon squirrels from Lassen County, received at the laboratory June 26 and 30, 1936, 8 squirrels from Modoc County, received on June 20 and 30, and 29 squirrels from Santa Cruz County, received June 25 and 26.

Three of the squirrels from Lassen County were from ranches 15 miles east and 12 miles south of Adin, and 1, received June 30, was from a ranch 7 miles south and 8 miles west of Adin. Two of the squirrels from Modoc County were from places 1 mile south and 2 miles south and 2 miles west of Buck Creek Ranger Station, Fandango Valley, 1 was from near Hackamore C. C. C. Camp, Modoc National Forest, 3 were from places 7 and 8 miles north and 5 miles east of Davis Creek, and 2 were from places 6 miles south and 7 miles south and 1 mile west of Pine Creek. Of the 29 squirrels from Santa Cruz County, 21 were from ranches 6 miles east and 4 miles northeast of Watsonville, and 8 were from a ranch at Chittenden Station.

Plague infection has been reported proved, on June 9, 11, and 12, by animal inoculation, in fleas taken from 123 squirrels, *Citellus armatus*, from a ranch 23 miles southeast of Idaho Falls, Bonneville County, Idaho.

WEEKLY REPORTS FROM CITIES

City reports for week ended June 27, 1936

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths all causes
		Cases	Deaths								
Maine:											
Portland	0	------	0	74	2	0	0	0	0	5	22
New Hampshire:											
Concord	0	------	0	0	0	0	0	0	0	0	9
Nashua	0	------	0	3	0	0	0	0	0	0	--------
Vermont:											
Barre	--------	------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Burlington	0	------	0	6	0	0	0	0	0	2	14
Rutland	0	------	0	5	1	0	0	0	0	0	4
Massachusetts:											
Boston	3	------	0	174	23	30	0	7	0	41	210
Fall River	0	------	0	0	3	1	0	1	0	3	27
Springfield	0	------	0	1	1	1	0	1	2	5	35
Worcester	0	------	0	59	0	7	0	2	0	5	43
Rhode Island:											
Pawtucket	0	------	0	0	0	0	0	0	0	0	--------
Providence	0	------	0	2	1	13	0	1	0	1	60
Connecticut:											
Bridgeport	0	------	0	2	1	0	0	0	0	0	32
Hartford	0	------	0	1	2	3	0	1	0	2	27
New Haven	0	------	0	0	1	0	0	1	1	10	37
New York:											
Buffalo	0	------	0	75	4	11	0	4	0	7	144
New York	33	4	2	727	54	144	0	94	5	94	1,330
Rochester	0	------	0	0	5	4	0	1	0	0	47
Syracuse	0	------	0	51	0	6	0	1	0	16	47
New Jersey:											
Camden	0	------	0	8	0	1	0	0	1	0	23
Newark	0	------	0	26	3	17	0	7	0	22	90
Trenton	0	------	0	2	1	3	0	2	0	7	25
Pennsylvania:											
Philadelphia	4	3	1	182	13	35	0	24	2	56	424
Pittsburgh	2	------	1	5	10	72	0	3	0	34	137
Reading	1	------	0	11	0	3	0	0	0	2	20
Scranton	0	------	--------	0	-------	0	0	-------	0	0	--------
Ohio:											
Cincinnati	4	2	0	3	5	9	0	9	2	0	112
Cleveland	4	1	0	120	10	32	0	12	0	90	162
Columbus	4	1	1	2	3	3	0	6	0	10	84
Toledo	0	2	2	8	6	1	0	3	0	17	59
Indiana:											
Anderson	0	------	0	0	0	7	0	0	0	3	8
Fort Wayne	5	------	0	0	1	1	0	0	0	0	17
Indianapolis	0	------	2	3	10	4	0	8	0	11	113
South Bend	0	------	0	0	2	0	0	0	0	1	21
Terre Haute	0	------	0	0	0	0	0	0	0	0	26
Illinois:											
Alton	0	------	0	0	2	5	0	0	0	0	8
Chicago	20	2	2	10	40	98	0	30	0	65	619
Elgin	0	------	0	1	0	0	0	0	0	3	6
Moline	0	------	0	2	0	2	0	0	0	0	7
Springfield	0	1	0	2	0	3	0	1	0	3	17
Michigan:											
Detroit	3	------	2	16	16	114	0	19	1	172	264
Flint	0	------	0	0	1	5	0	1	0	14	26
Grand Rapids	0	------	0	1	2	4	0	0	0	3	33
Wisconsin:											
Kenosha	0	------	0	0	0	2	4	0	0	1	4
Milwaukee	0	------	0	24	5	61	0	3	1	66	85
Racine	0	------	0	1	1	4	0	0	0	2	12
Superior	0	------	0	0	0	3	0	0	0	0	6
Minnesota:											
Duluth	0	------	0	3	3	6	0	0	0	17	26
Minneapolis	2	------	2	28	3	27	0	0	0	2	96
St. Paul	0	------	0	72	2	11	0	5	0	6	44

See footnotes at end of table.

City reports for week ended June 27, 1936—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths all causes
		Cases	Deaths								
Iowa:											
Cedar Rapids	3			0		0	0		0	3	
Davenport	0			0		2	0		0	0	
Des Moines	2			2		0	2		0	0	26
Sioux City	0			3		5	5		0	0	
Waterloo	0			0		6	0		0	0	
Missouri:											
Kansas City	2		0	3	2	28	0	4	0	0	92
St. Joseph	--										
St. Louis	7			14	9	21	0	10	3	12	217
North Dakota:											
Fargo	0		0	0	1	3	0	0	0	0	15
Grand Forks	0			0		0	0		0	0	
Minot	0		0	0		2	0		0	0	7
South Dakota:											
Aberdeen	0			0		0	0		0	0	
Nebraska:											
Omaha	0		0	4	5	9	3	1	0	1	55
Kansas:											
Lawrence	0		0	0	0	0	0	0	0	0	
Topeka											
Wichita	0		0	1	0	0	0	0	0	0	27
Delaware:											
Wilmington	0		0	3	0	0	0	1	0	2	24
Maryland:											
Baltimore	2	2	2	171	12	7	0	8	1	82	102
Cumberland	0		0	0	0	1	0	1	0	0	8
Frederick	0		0	0	0	0	0	0	0	1	5
District of Columbia:											
Washington	5		0	133	8	6	0	13	0	33	155
Virginia:											
Lynchburg	0		0	0	0	0	0	0	0	3	8
Richmond	0		1	0	2	5	0	2	1	0	51
Roanoke	0		0	2	0	1	0	0	1	0	6
West Virginia:											
Charleston	0	1	0	0	2	1	0	2	0	4	17
Wheeling	0		0	11	4	0	0	0	0	0	21
North Carolina:											
Gastonia	0	3	0	0	0	0	0	0	0	0	
Raleigh	0		0	0	2	0	0	0	0	0	18
Wilmington	0		0	0	1	0	0	0	0	2	10
Winston-Salem	0		0	1	1	0	0	2	0	0	23
South Carolina:											
Charleston	0		0	0	1	0	0	0	1	1	18
Columbia											
Florence	0		0	0	2	0	0	1	0	3	12
Georgia:											
Atlanta	2	3	0	2	6	2	0	5	1	1	93
Brunswick	0		0	0	0	0	0	0	0	0	1
Savannah	3		0	0	0	1	0	2	2	0	35
Florida:											
Miami	0		0	2	0	0	0	3	0	6	30
Tampa	0		0	4	2	0	0	1	0	0	26
Kentucky:											
Ashland	0		0	0	0	0	0	0	0	0	
Covington	0		0	1	0	0	0	0	0	0	16
Lexington	0		0	0	1	0	0	2	1	2	21
Louisville	1		1	4	8	5	0	2	1	5	67
Tennessee:											
Knoxville	2		0	1	5	0	0	2	2	0	24
Memphis	1		0	0	2	0	0	3	1	16	88
Nashville	0		0	10	5	1	0	4	1	0	60
Alabama:											
Birmingham	1		0	1	3	0	0	2	5	1	66
Mobile	0		1	0	2	0	0	1	0	0	19
Montgomery	0	1		0		0	0		0	0	
Arkansas:											
Fort Smith	0			0		0	0		0	0	
Little Rock	0		0	0	0	0	0	2	0	0	
Louisiana:											
Lake Charles	0		0	1	0	0	0	0	0	0	7
New Orleans	4	2	0	0	15	0	0	15	0	17	157
Shreveport	0		0	0	4	2	0	4	1	0	47

See footnotes at end of table.

City reports for week ended June 27, 1936—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths all causes
		Cases	Deaths								
Oklahoma:											
Oklahoma City	1	6	0	2	3	2	0	1	3	2	56
Tulsa	0	----	----	0	----	3	0	----	0	2	----
Texas:											
Dallas	3	----	0	32	10	0	0	4	1	1	81
Fort Worth	0	----	0	8	3	2	0	2	0	0	57
Galveston	0	----	0	0	6	0	0	3	0	0	23
Houston	3	----	0	0	3	1	0	6	0	0	82
San Antonio	3	----	0	2	9	0	0	8	0	0	105
Montana:											
Billings	0	----	0	1	0	3	0	0	0	0	5
Great Falls	0	----	0	1	0	0	2	0	0	2	7
Helena	0	----	0	1	0	2	1	0	0	0	7
Missoula	0	----	0	0	0	2	0	0	0	0	8
Idaho:											
Boise	0	----	0	0	2	0	0	0	0	0	6
Colorado:											
Colorado Springs	0	----	0	0	0	1	0	1	0	0	9
Denver	2	----	1	8	11	6	1	2	0	46	87
Pueblo	0	----	0	1	1	4	0	1	0	0	15
New Mexico:											
Albuquerque	0	----	0	6	1	3	0	4	0	0	16
Utah:											
Salt Lake City	1	----	1	9	2	11	3	1	0	7	40
Nevada:											
Reno	----	----	----	----	----	----	----	----	----	----	----
Washington:											
Seattle	0	----	----	53	1	2	1	5	1	3	56
Spokane	0	----	----	10	2	9	0	1	0	6	19
Tacoma	0	----	0	5	3	3	0	0	0	0	32
Oregon:											
Portland	0	1	0	3	5	4	1	2	0	19	85
Salem	0	----	----	3	----	0	0	----	0	0	----
California:											
Los Angeles	7	5	0	83	12	28	0	30	0	49	323
Sacramento	0	----	0	0	0	6	0	4	1	13	23
San Francisco	0	1	0	37	5	42	0	7	0	5	151

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Rhode Island:			
Providence	0	1	0
New York:			
New York	11	5	2
Pennsylvania:			
Philadelphia	2	1	0
Pittsburgh	0	1	0
Ohio:			
Cleveland	1	1	0
Illinois:			
Chicago	5	3	0
Springfield	1	0	0
Michigan:			
Detroit	3	0	0
Flint	0	0	1
Delaware:			
Wilmington	1	0	0
Maryland:			
Baltimore	1	0	0
District of Columbia:			
Washington	1	0	0
Virginia:			
Lynchburg	2	0	0
West Virginia:			
Wheeling	0	1	0
South Carolina:			
Charleston	2	1	0
Kentucky:			
Louisville	0	1	0
Tennessee:			
Knoxville	1	0	0
Alabama:			
Birmingham	1	0	0
Louisiana:			
New Orleans	1	1	0
Shreveport	0	1	0
Washington:			
Spokane	1	0	0
California:			
Los Angeles	2	1	3

Epidemic encephalitis.—Cases: Washington, D. C., 1; Miami, 1.
Pellagra.—Cases: Baltimore, 1; Wilmington, N. C., 1; Charleston, S. C., 1; Atlanta, 1; Savannah, 4; Birmingham, 1; New Orleans, 1.
Typhus fever.—Cases: Newark, 1; Charleston, S. C., 1; Savannah, 1.

FOREIGN AND INSULAR

IRISH FREE STATE

Vital statistics—First quarter 1936.—The following statistics for the Irish Free State for the quarter ended March 31, 1936, are taken from the Quarterly Return of Marriages, Births, and Deaths, issued by the Registrar General, and are provisional:

	Number	Rates per 1,000 population
Population	3,033,000	----------
Marriages	3,807	5.0
Births	14,429	19.0
Total deaths	12,869	17.0
Deaths under 1 year of age	1,223	(1)
Deaths from—		
Cancer	891	1.18
Diarrhea and enteritis (under 2 years of age)	142	----------
Diphtheria	87	----------
Influenza	268	.35
Measles	65	----------
Puerperal sepsis	25	[2] 1.73
Scarlet fever	40	----------
Tuberculosis (all forms)	935	1.23
Typhoid fever	13	----------
Whooping cough	71	----------

[1] Deaths under 1 year per 1,000 births, 85.
[2] Per 1,000 births.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for June 26, 1936, pages 858-870. A similar cumulative table will appear in the PUBLIC HEALTH REPORTS to be issued July 31, 1936, and thereafter, at least for the time being, in the issue published on the last Friday of each month.

Cholera

India—Negapatam.—During the week ended June 27, 1936, 13 cases of cholera with 9 deaths were reported at Negapatam, India.

Plague

Senegal—Dakar.—During the week ended June 27, 1936, 1 case of plague with 1 death was reported at Dakar, Senegal.

United States.—A report of plague-infection in rodents in Lassen, Modoc, and Santa Cruz Counties, California, and in Bonneville County, Idaho, appears on page 982 of this issue of PUBLIC HEALTH REPORTS.

Smallpox

Portugal—Oporto.—During the week ended June 13, 1936, 1 case of smallpox was reported at Oporto, Portugal.

Straits Settlements—Singapore.—During the week ended June 20, 1936, 1 imported case of smallpox was reported at Singapore, Straits Settlements.

Typhus Fever

Egypt—Suez.—During the week ended June 27, 1936, 1 case of typhus fever was reported at Suez, Egypt.

Iraq—Baghdad.—During the week ended June 27, 1936, 1 case of typhus fever was reported at Baghdad, Iraq.

Yellow Fever

Bolivia—Santa Cruz Department—La Pesca.—During the month of May 1936, 1 case of yellow fever was reported at La Pesca, Santa Cruz Department, Bolivia.

Brazil.—Yellow fever has been reported in Brazil as follows: Sao Joao dos Patos, Maranhao State, May 28, 1936, 1 case, 1 death; Minas Geraes State, Dourados, May 21, 1936, 1 case, 1 death; Uberaba, May 23, 1936, 1 case, 1 death; Sao Paulo State, Altinopolis, May 26, 1936, 1 case, 1 death; Cajuru, May 22, 1936, 1 case, 1 death; Tambahu, May 23 and 24, 1936, 2 cases, 2 deaths.

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